

Transcript of the Testimony of
VALERIE J. HARWOOD, Ph.D.

1/29/2008

W. A. DREW EDMONDSON, et al.

vs.

TYSON FOODS, INC., et al.

4:05-CV-00329-TCK-SAJ

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VALERIE J. HARWOOD

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IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his)
capacity as ATTORNEY GENERAL)
OF THE STATE OF OKLAHOMA and)
OKLAHOMA SECRETARY OF THE)
ENVIRONMENT C. MILES TOLBERT,)
in his capacity as the)
TRUSTEE FOR NATURAL RESOURCES)
FOR THE STATE OF OKLAHOMA,)

Plaintiffs,)

vs.)

4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al,)

Defendants.)

- - - - -

THE VIDEOTAPED DEPOSITION OF
VALERIE J. HARWOOD, Ph.D., produced as a witness
on behalf of the Defendants in the above styled and
numbered cause, taken on the 29th day of January,
2008, in the City of Tulsa, County of Tulsa, State
of Oklahoma, before me, Bonnie Glidewell, a
Certified Shorthand Reporter, duly certified under
and by virtue of the laws of the State of Oklahoma.

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1 Q Pseudonomas, that one is going to be tough for
2 me. Aeronomas -- say that again.

3 A Aeronomas.

4 Q Aeronomas, Enterococci, and bacteria that are
5 either unknown to humans or that are unknown to you? 08:50AM

6 A Microbacterium/avium complex.

7 Q Okay.

8 A Cyanobacteria in high concentrations. Again,
9 I'm dredging my memory, but those are the ones that
10 come to my mind at the moment. 08:50AM

11 Q Okay. Thank you so much. Now, in this case,
12 is it true that you discovered a bacteria that had
13 not previously been catalogued?

14 A Correct.

15 Q What is that bacteria? Does it have a name? 08:51AM

16 A It's a Brevibacterium species. Brevibacterium
17 is B-r-e-v-i-b-a-c-t-e-r-i-u-m.

18 Q Does this bacteria have a specific name,
19 though? I want to make sure I refer to it by
20 something where we can understand each other. 08:51AM

21 A Oh, you can just call it the Brevibacterium if
22 you want to.

23 Q All right, I'm going to call it the Harwood
24 bacteria, because then that will separate it from
25 the others, and like Edmund Hillary, you will be 08:51AM

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1 famous.

2 **A** Call it the biomarker, how's that?

3 **Q** I'm going to call it the Harwood bacteria.

4 When I call it the Harwood bacteria, do you know

5 what I'm referring to? You won't be confused? 08:51AM

6 **MR. PAGE:** Object to the form.

7 **THE WITNESS:** You will make me laugh every

8 time you say that.

9 **Q** (By Mr. Jorgenson) All right. Well, that's a
10 nice side effect of depositions. You didn't list 08:51AM

11 the Harwood bacteria in the list of bacteria that
12 you're worried might cause human health risk in the
13 watershed.

14 **A** Correct.

15 **Q** Why is that? 08:52AM

16 **A** Because it is intended to be not a pathogen,
17 itself, but a specific indicator of poultry litter
18 contamination.

19 **Q** Okay. When you say "not a pathogen, itself,"
20 in case the judge, like me, is not a science, you 08:52AM
21 mean that the Harwood bacteria doesn't cause
22 disease?

23 **A** No, I don't mean that, because Enterococci
24 cause disease but they are not obligate pathogens;
25 they are opportunistic pathogens, and we use them as 08:52AM

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1 indicators, general indicators of fecal pollution.

2 Q What do you mean, then, when you say the
3 Harwood bacteria is not a pathogen?

4 A It's not a -- it's not a -- it hasn't been
5 shown to be a human pathogen. 08:52AM

6 Q Okay. So to state it separately, is it fair
7 to say you have no evidence that it's a human
8 pathogen?

9 A That's correct.

10 Q You've submitted two affidavits in this case; 08:53AM
11 is that right?

12 A I had an affidavit and a supplemental
13 affidavit.

14 Q Okay. Thank you. And your affidavits
15 discussed, generally speaking, the effect of land 08:53AM
16 application of poultry litter on the Illinois River
17 watershed; is that a fair statement?

18 A Yes.

19 Q Do you want me to say it again?

20 A Yeah, say that again, please. 08:53AM

21 Q They discuss the land, the effect of the land
22 application of poultry litter on the Illinois River
23 watershed?

24 A Yes.

25 Q Have you visited the watershed as part of your 08:53AM

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1 Q Will you turn -- they've got a little number
2 there at the bottom, which helps us all know that
3 we're on the same page. Turning to the page that's
4 Bates numbered 5582. This is the last page in my
5 set; I hope it is yours too. Do you see paragraph,
6 it's a final paragraph that begins "microbiology is
7 a field"?

09:08AM

8 A Uh-huh.

9 Q Will you read that?

10 A "Microbiology is a field that is heavily
11 method-dependent for accurate results. The standard
12 methods developed for food and water analysis have
13 undergone substantial testing in various
14 laboratories across the country to insure accuracy
15 and reproducibility of results. There is no sound
16 reason for analytical testing laboratories to use
17 nonstandard methods outside of methods comparison
18 studies. Because nonstandard methods were used for
19 enumeration of total coliforms, E. coli, Salmonella
20 species and Campylobacter species, the data
21 generated from these analyses are not useful for
22 assessing water quality in the samples analyzed by
23 FoodProtech."

09:08AM

09:09AM

09:09AM

24 Q What are you talking about here in this
25 paragraph?

09:09AM

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1 **A** I'm talking about the analysis of water
2 samples for indicator bacteria.

3 **Q** And --

4 **A** And --

5 **Q** I didn't mean to interrupt. Go ahead. 09:09AM

6 **A** And pathogens.

7 **Q** Did you receive some data from FoodProtech
8 that did not measure up to standard protocols?

9 **A** Yes.

10 **Q** What did you do with that data? 09:09AM

11 **A** Can you rephrase that? I'm not sure what you
12 mean by what did I --

13 **Q** Yes. I'm glad you asked. Did you rely on
14 that data or did you exclude that data from your
15 analysis? 09:09AM

16 **A** Those data were excluded from the analysis.

17 **Q** Okay. Now, you discuss here the importance of
18 following established standards when enumerating
19 bacteria?

20 **A** Yeah, standard methods. 09:10AM

21 **Q** Standards methods, thank you for clarifying.
22 Why is it important to follow standard methods?

23 **A** When standard methods exist, and they don't in
24 all cases, when standard methods exist, they are
25 methods that have been validated across a number of 09:10AM

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1 labs and they are accepted by organizations as
2 reliable methods for water quality testing. They
3 allow comparison of results from one area of the
4 country to another, for example. And so when we use
5 these methods, standard methods, in our studies,
6 then we can ensure that we're following laboratory
7 practices that are, again, accepted across the
8 country.

09:10AM

9 Q Okay. And what -- you testified that you
10 excluded the data that was generated using
11 nonstandard methods?

09:10AM

12 A Correct.

13 Q And you think that's the appropriate course of
14 action?

15 A Definitely.

09:11AM

16 Q Are the --

17 A Just let me clarify. And that is where
18 standard methods exist for the testing. There are
19 many types of testing where standard methods don't
20 exist.

09:11AM

21 Q I'm glad you clarified that. Just to make
22 sure we have it, so where standard methods exist for
23 testing, and those standards methods are not
24 followed, the appropriate course is to exclude those
25 results?

09:11AM

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1 **A** Correct.

2 **Q** Are there standard methods for enumerating
3 each of the bacteria we discussed earlier?

4 **A** Not all of them. Most of them.

5 **Q** Which ones do not have standard methods for 09:11AM
6 enumeration? Do you need to look at my list? Would
7 that be helpful if you can read my writing?

8 **A** Yes. Actually, several of them don't have
9 standard methods for water, several of them only
10 have standard methods in food. But the ones that -- 09:12AM
11 probably the ones that are the -- that I can think

12 of that really don't have standard methods would be
13 microbacterium avium complex. I think the EPA has a
14 method out for Aeromonas, but it's not really a
15 standard method. Pseudomonas, as well, I wouldn't 09:12AM
16 say a standard methods for those exist; and

17 antibiotic-resistant bacteria, there are medical
18 standards for testing for antibiotic resistance but
19 none, really, for the water quality industry. There
20 are standard methods for testing for E. coli 09:12AM
21 01357:H7 in food, but I'm not aware of standard

22 methods for testing in water. And Salmonella ,
23 Salmonella, again, has a standard method in --
24 definitely in food, as well as Campylobacter. Some
25 of the standards methods allow various substitutions 09:13AM

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1 and steps, depending on the confirmation of the
2 bacteria, so some of them have some variability,
3 flexibility in terms of method.

4 Q Thank you, that's helpful. Let's turn back to
5 these letters, the Olsen letters, that I believe 09:13AM
6 have been marked Exhibit 4. Can you go to the page
7 that's Bates numbered 5598; on my exhibit it's the
8 front page.

9 A Yes.

10 Q On the second paragraph, do you see where it 09:13AM
11 begins "standard methods"?

12 A Yes.

13 Q Can you read that paragraph into the record?
14 Or, actually, can you read from there to the end of
15 the page into the record. 09:13AM

16 A "Standard methods for the enumeration of these
17 analytes are propagated by groups such as
18 APHA/AWWA/WEF. Standard methods for the examination
19 of water and wastewater, the U.S. Environmental
20 Protection Agency, US EPA, and the Food And Drug 09:14AM
21 Administration, FDA. Laboratories should routinely
22 utilize standard methods for microbial analysis, or,
23 in the case of unusual samples, adaptations which
24 follow the standard methods as closely as possible.
25 In some cases standard methods have been developed 09:14AM

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1 for microbial analytes in one sample type, e.g.
2 Salmonella species in food but have not yet been
3 written for other sample types. In such cases, best
4 laboratory practices are that an existing standard
5 method is adapted for the new sample type which
6 employs similar principles for isolation,
7 characterization and confirmation of the organisms.

09:14AM

8 "Defined standard methods for the enumeration
9 of the following microbial analytes in water exist:

10 Total coliforms, fecal coliforms, E. coli,
11 Escherichia coli, Enterococci and Staphylococcus
12 species. In addition, standard methods for the
13 Examination of Water and Wastewater contains
14 suggested methods" --

09:14AM

15 MR. BULLOCK: Doctor, you might slow down.
16 The reporter is beginning to breathe hard.

09:15AM

17 THE WITNESS: So starting with the list
18 again, "total coliforms, fecal coliforms,
19 Escherichia coli, Enterococci and Staphylococcus
20 species.

09:15AM

21 "In addition, standard methods for the
22 examination of water and wastewater contains
23 suggested methods and guidelines for the
24 Campylobacter species and Salmonella species and the
25 FDA Bacteriological and Analytical Manual for

09:15AM

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1 analysis of food and water also contains standard
2 methods for Campylobacter and Salmonella."

3 Q (By Mr. Jorgenson) Thank you, Professor
4 Harwood. In the paragraph you just read, you note
5 the, specifically, the importance of following
6 methods approved by the EPA or the FDA; is that
7 right?

09:16AM

8 A Uh-huh.

9 Q Why is that?

10 A Standard methods are important because, where
11 they exist they allow comparison of results across
12 the country, between labs. They give assurance of
13 consistency in the method of analysis. Microbiology
14 is a very methods-driven field, and so if one is
15 analyzing an organism that has regulatory
16 importance, then standard methods are really
17 necessary, again, in order to be able to compare
18 from one area of the country, one laboratory to
19 another.

09:16AM

09:16AM

20 Q Okay. Turn in this document, if you would, to
21 the page that's been Bates numbered 5581; on my
22 copy, it's the penultimate page. Turn to, if you
23 would, the penultimate paragraph; you see that,
24 "regarding 2.2.3"?

09:16AM

25 A Uh-huh.

09:17AM

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1 interpretation of the author; in other words, are
2 the data sufficient to support the author's
3 interpretation. Peer review also reviews the form
4 in which it's presented, so is this understandable.

5 Is there enough data presented so that the reader 09:19AM
6 can gauge for themselves the validity of the work.

7 Q And in the field of microbiology, is there
8 room for error?

9 MR. PAGE: Object to the form.

10 THE WITNESS: Can you clarify that. 09:19AM

11 Q (By Mr. Jorgenson) In the field of
12 microbiology, do people make mistakes?

13 MR. PAGE: Same objection.

14 THE WITNESS: Yes.

15 Q (By Mr. Jorgenson) And peer review helps 09:19AM
16 uncover any mistakes or errors?

17 A Well, I have certainly uncovered errors in
18 peer review of other people's papers, so yes.

19 Q I believe you've testified you submitted two
20 affidavits to the court in this case, so let me just 09:20AM
21 ask that a different way. Have you submitted two
22 affidavits to the court in this case?

23 A I submitted a first affidavit, first
24 affidavit, and then a supplemental affidavit.

25 Q Okay, let's get them out. Here is your first 09:20AM

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1 **A** The methods for testing for 0157:H7 are poor,
2 at best, in water samples. Organism -- there's a
3 lot of different methods. We would have had to
4 choose one. We had a variety of different, you
5 know, analytes to test for. The whole thing was,
6 obviously, a very expensive project. So like in all
7 microbial investigations, we have to pick and choose
8 which organisms we're going to test for.

10:59AM

9 **Q** But to be clear, you didn't test for it?

10 **A** That's correct.

10:59AM

11 **Q** You have no evidence that it exists in the
12 Illinois River watershed?

13 MR. PAGE: Object to the form.

14 **Q** (By Mr. Jorgenson) Do you have any evidence
15 that E. coli 0157 exists in the Illinois River
16 watershed?

10:59AM

17 MR. PAGE: Same objection.

18 THE WITNESS: No we didn't test for it.

19 **Q** (By Mr. Jorgenson) But you did discuss the
20 0157 strain and its effects at length in your
21 affidavit?

10:59AM

22 **A** Sure, because, again, it's been found in
23 poultry. And again, so as animal husbandry
24 practices change, as the genetics of chicken flocks
25 change, as our treatment of water changes, all of

10:59AM

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1 many more components were measured than that. But
2 those are the ones than stand out in my mind.

3 Q Okay. To be clear, you didn't have any work,
4 any part in developing this venture?

5 A That's correct. 01:41PM

6 Q Well, that saved us a whole ton of questions.

7 A Good.

8 Q Do you know if the elements of this signature
9 suggest the presence of bacterial pathogens?

10 A I would not, I would say I don't know that we 01:41PM
11 have not tested the correlation.

12 Q So if there is a correlation, you don't know
13 whether there is one or not?

14 A Correct.

15 Q Have you reviewed the work in identifying the 01:41PM
16 signature?

17 A No.

18 Q Has this work identifying a signature been the
19 subject of any published articles?

20 A Not to my knowledge. 01:41PM

21 Q I think it's subsumed in what I just said, but
22 I'll do it anyway. Has the signature been the
23 subject of peer review?

24 A Not to my knowledge.

25 Q What is your basis for including it in your 01:41PM

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1 this?

2 **A** Yes, I have.

3 **Q** When?

4 **A** My student and I just got our vibrio

5 alginolyticus assay published; as I mentioned, 02:26PM

6 that's not on my CV because it was just accepted in

7 December. For vibrio alginolyticus, it's a marine

8 pathogen.

9 **Q** When you say "published," you mean published

10 in a peer-reviewed journal? 02:27PM

11 **A** Yes, in the (inaudible) Journal of

12 Microbiology.

13 **Q** Okay, let's transition to what I call the

14 Harwood bacterium, the bacteria you found in this

15 case. 02:27PM

16 Did you testify, before, that your work in

17 identifying the Harwood bacterium has been submitted

18 for a poster or a report?

19 **A** That's correct.

20 **Q** And a poster or report is not a peer-reviewed 02:27PM

21 article?

22 **A** That's correct. It's generally the first step

23 in our scientific process of going from our research

24 and our data to presenting it and then finally the

25 peer-reviewed article. 02:27PM

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1 **Q** Will you pull out the letters that you wrote
2 to Roger Olsen. Let's see which exhibit number are
3 they? You've got the original ones there. This is
4 Exhibit 4?

5 **A** All right. 02:28PM

6 **Q** Turn to page 5581.

7 **A** All right.

8 **Q** Oh, you're there okay. The penultimate
9 paragraph that begins "regarding 2.2.3"?

10 **A** Uh-huh.

11 **Q** Do you say to him "these supporting documents
12 are from posters and reports, not from peer-reviewed
13 journals. As such, they do not carry the scientific
14 weight of peer-reviewed publications"?

15 **A** Yeah. Keep in mind this is about methods that 02:28PM
16 should not be standard methods. This is not about
17 the cutting edge, this is not about a method to
18 detect a microbial source tracking such as the one
19 we just used.

20 **Q** And do you agree that the process to which 02:28PM
21 you've submitted your work on the process for
22 identifying the Harwood bacteria, that that does not
23 carry the scientific weight of peer-reviewed
24 publications?

25 **A** That's correct. But, again, it's the normal 02:28PM

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1 procedures that we go through in science. And, of
2 course, we aren't even -- that, that research is not
3 even finished yet.

4 **Q** Okay, and I understand that. So what we're
5 saying is, I think we're saying the same thing, your 02:29PM
6 work on the Harwood bacterium, the Brevibacterium,
7 has not yet had the benefit of the peer-review
8 process; that is to come.

9 **A** Right.

10 **Q** Okay. I think we can move on. So is it your 02:29PM
11 testimony that the plaintiffs have identified a
12 bacteria that is unique to poultry?

13 **A** Well, no, we cannot say that it's unique to
14 poultry because we did find it in a certain amount
15 of duck and goose fecal samples. So I would say 02:29PM
16 it's highly associated with poultry.

17 **Q** Okay.

18 **A** And then, within the usage in our microbial
19 source tracking community, it is specific to
20 poultry; again, people don't usually -- don't demand 02:29PM
21 absolute specificity when they talk about
22 specificity.

23 **Q** And is the reason they don't demand absolute
24 specificity is because it's extraordinarily
25 difficult to find anything that is specific to one 02:30PM

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1 treated. And then if they do go to the hospital and
2 get diagnosed, it's very frequently often seems to
3 be foodborne rather than waterborne.

4 Q But my question is this. If people are
5 obtaining most of their drinking water from a 03:28PM
6 particular spring and getting sick from drinking
7 that water, don't you believe that eventually they
8 would make an association between the drinking of
9 that water and diarrhea?

10 A Yeah, I do. I don't know that, I don't know 03:28PM
11 even that that spring is one, again, that's
12 contaminated or not. We just went to it, you know,
13 as an example of the spring.

14 Q And I think this was asked, I came in late
15 from lunch, and I think that I Mr. Jorgenson asked 03:29PM
16 just as I was walking in, but I want to ask it of
17 you because I've been asking it of everybody, and
18 that is, it's true, is it not, Doctor that you could
19 not identify one single person in the history of the
20 IRW who has gotten sick from drinking water that was 03:29PM
21 contaminated by chicken litter?

22 A Well, again, that's a very daunting task.
23 People don't -- you know, epidemiology is really not
24 often done, but, you know, personally, I mentioned
25 we did not carry out any epidemiology tests. 03:29PM

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1 Q And you can identify no such person who has
2 become sick from drinking water contaminated by
3 chicken litter in the IRW; isn't that true?

4 A I can't identify any persons. We know about
5 the increase in indicator bacteria.

03:29PM

6 Q And, Doctor, do you know who it is among the
7 team of experts for the State of Oklahoma in this
8 case whose job it has been to identify such a
9 person?

10 MR. PAGE: Object to the form.

03:29PM

11 THE WITNESS: Can you restate that.

12 Q (By Mr. Elrod) Do you know whose job among
13 the expert panel it is to identify a person who has
14 become sick from drinking water contaminated by
15 chicken litter in the IRW?

03:30PM

16 MR. PAGE: Same objection.

17 THE WITNESS: Again, we focussed our
18 investigation on the known indicators of fecal
19 contamination that have human health risks. We
20 haven't tried to identify people.

03:30PM

21 Q (By Mr. Elrod) So is it your testimony that
22 no one on the expert panel of the State of Oklahoma
23 in this case has been charged with responsibility to
24 find and identify an actual person who's become ill
25 as a result of drinking water contaminated by

03:30PM